Federal Democratic Republic of Ethiopia

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ET ISO 2172 (2012) (English): Fruit juice -- Determination of soluble solids content -- Pycnometric method

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ETHIOPIAN STANDARD

ES ISO 2172:2012

First edition

Fruit juice - Determination of soluble solids content - Pyknometric method

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for Non Alcoholic Beverages (TC 27) and published by the Ethiopian Standards Agency (ESA). The standard is identical with ISO 2172:1983 Fruit juice - Determination of soluble solids content - Pyknometric method published by the International Organization for Standardization ISO 1983.

For the purpose of this Ethiopian Standard, the adopted text shall be modified as follows.

- The phrase “International Standard” shall be read as “Ethiopian Standard”; and
- A full stop (.) shall substitute comma (,) as decimal marker.

Fruit juice — Determination of soluble solids content — Pyknometric method

1 Scope and field of application

This International Standard specifies a pyknometric method for the determination of the soluble solids content of fruit juice.

The method is applicable to fruit juice containing no suspended matter and to clear concentrated juice. It is not applicable to other fruit and vegetable products, for which the method specified in ISO 2173 should be used.

2 Reference

ISO 2173, *Fruit and vegetable products — Determination of soluble solids content — Refractometric method.*

3 Definition

soluble solids content of a juice (determined by the pyknometric method) : The sucrose concentration of an aqueous solution having the same relative density as the juice analysed, under specified conditions of preparation and temperature.

This concentration is expressed in grams per 100 g. The soluble solids content of fruit juice may also be expressed in grams per 100 ml.

4 Principle

Measurement of the relative density of a test portion at 20 °C using a pyknometer, and conversion, using a table, of the relative density into the soluble solids content expressed as sucrose.

5 Apparatus

Usual laboratory equipment, and

5.1 Pyknometer, of capacity 50 ml.

5.2 Pyknometer funnel.

5.3 Water bath, capable of being controlled at 20 ± 0,2 °C.

5.4 Calibrated thermometer, graduated in 0,2 °C or 0,1 °C divisions over the range from 10 to 30 °C.

5.5 Analytical balance.

6 Procedure

6.1 Preparation of the test sample

6.1.1 Fruit juice

Thoroughly mix the laboratory sample.

In cases where the juice contains considerable quantities of carbon dioxide, remove as much as possible by shaking 250 ml of the juice in a 1 000 ml flask, or by filtration over 2 g of cotton wool placed in a Buchner funnel.

6.1.2 Concentrated juice

Throughly mix the laboratory sample and dilute the juice as follows.

Weigh, to the nearest 0,001 g, in a 100 ml one-mark volumetric flask, a quantity of the laboratory sample such that the soluble solids content of the final solution is about 20 to 25 %. Dilute to the mark with distilled water and mix carefully.

NOTE — In some cases, it is useful to dilute to 8 to 10 % soluble solids content.

6.2 Supplementary treatment

6.2.1 If the test sample is turbid, filter it through a folded, rapid filter paper, in a covered funnel, or centrifuge it in stoppered tubes.

6.2.2 If the initial product contains a relatively large quantity of ethanol, it is necessary to remove it from the test sample by the following method. Take exactly 100 ml of the test sample, place in a dry container and heat on a boiling water bath so that the volume of the sample is reduced to one-third. Then transfer the remainder into a 100 ml one-mark volumetric flask, dilute to the mark with rinsing water and shake. This treatment is not necessary in cases where the quantity of ethanol does not exceed 0,5 g per 100 ml of the test solution.

6.3 Determination

Rinse the pyknometer (5.1) successively with ethanol and diethyl ether and dry the inside using a current of dry air, having completely washed, degreased and drained it. Wipe the outside of the pyknometer with a dry cloth or filter paper and insert the stopper. Leave the pyknometer on the balance (5.5) for 30 min, then weigh to the nearest 0,000 2 g (mass m_0).

Using the funnel (5.2), fill the pyknometer with recently boiled and cooled distilled water, at a temperature of approximately 20 °C, in such a way that no air bubbles are trapped. The level of water shall only be slightly above the pyknometer mark. Immerse the pyknometer in the water bath (5.3), controlled at 20 °C and check the temperature by means of the calibrated thermometer (5.4). Leave the pyknometer in the water bath for 30 min, and make up the water level to the mark with distilled water.

Stopper the pyknometer, and wipe the outside as before with a cloth or filter paper. Leave the pyknometer on the balance for 30 min, then weigh to the nearest 0,000 2 g (mass m_1).

Carry out the determination of the mass of the pyknometer when full of water three times.

Empty the pyknometer, wash it successively with ethanol and diethyl ether and dry using a current of dry air. Fill the pyknometer with the test sample, brought to a temperature of approximately 20 °C, in such a way that no air bubbles are trapped, and immerse again in the water bath (5.3), controlled at 20 °C. Leave the pyknometer in the water bath for 30 min. Make up the level of juice to the mark and proceed as for the distilled water (mass m_2 being the mass of the pyknometer and juice).

NOTE — The mass of the empty pyknometer and the mass of the pyknometer full of water are the characteristics of the apparatus; it is not necessary to determine them for each measurement. However, it is advisable to check them periodically after prolonged use of the pyknometer.

6.4 Number of determinations

Carry out two determinations on the same test sample (6.1).

7 Expression of results

7.1 Calculation of relative density

The relative density at 20 °C (d_{20}^{20}) is equal to

$$\frac{m_2 - m_0}{m_1 - m_0}$$

where

m_0 is the mass, in grams, of the empty pyknometer;

m_1 is the mass, in grams, of the pyknometer filled with water at 20 °C;

m_2 is the mass, in grams, of the pyknometer filled with the test sample at 20 °C.

7.2 Soluble solids content

7.2.1 Fruit juice

From the calculated relative density (d_{20}^{20}) of the test sample, read directly from the table the soluble solids content (sucrose content) in grams per 100 g or in grams per 100 ml.

7.2.2 Concentrated juice

From the calculated relative density (d_{20}^{20}) of the test sample, read from the table the corresponding soluble solids content (sucrose content), c, in grams per 100 ml.

The soluble solids content, in grams per 100 g of the concentrated juice, is equal to

$$\frac{c \times 100}{m}$$

where

c is the sucrose concentration read from the table;

m is the mass, in grams, of concentrated juice (weighed in 6.1.2) contained in 100 ml of the test solution.

7.3 Result

Take as the result the arithmetic mean of the values obtained in the two determinations (6.4), provided that the requirement for repeatability (see 7.4) is fulfilled.

Report the result to one decimal place.

7.4 Repeatability

The difference between the values obtained in the two determinations (6.4), carried out simultaneously or in rapid succession by the same analyst, shall not exceed 0,1 % of the mean value of the relative density at 20 °C.

8 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating conditions not specified in this International Standard, or regarded as optional, as well as any incidents which may have influenced the results.

The test report shall give all the information necessary for the complete identification of the sample.

Table — Relative density (d_{20}^{20}) and corresponding sucrose concentration (soluble solids content)

d_{20}^{20}	Sucrose concentration		d_{20}^{20}	Sucrose concentration		d_{20}^{20}	Sucrose concentration		d_{20}^{20}	Sucrose concentration		d_{20}^{20}	Sucrose concentration	
	g/100 g	g/100 ml		g/100 g	g/100 ml		g/100 g	g/100 ml		g/100 g	g/100 ml		g/100 g	g/100 ml
1,0157	4,0	4,06	1,0326	8,2	8,45	1,0501	12,4	13,00	1,0680	16,6	17,70	1,0865	20,8	22,56
61	1	4,16	30	3	8,56	05	5	13,11	84	7	81	70	9	22,68
65	2	4,26	34	4	8,67	09	6	13,22	89	8	92	74	21,0	22,79
69	3	4,36	38	5	8,77	13	7	13,33	93	9	18,04	79	1	22,91
73	4	4,47	43	6	8,88	17	8	13,44	98	17,0	18,15	83	2	23,03
77	5	4,57	47	7	8,99	22	9	13,55	1,0702	1	18,27	88	3	23,15
81	6	4,67	51	8	9,09	26	13,0	13,66	06	2	18,38	92	4	23,27
85	7	4,78	55	9	9,20	30	1	13,77	11	3	18,50	97	5	23,38
89	8	4,88	59	9,0	9,31	34	2	13,88	15	4	18,61	1,0901	6	23,50
93	9	4,99	63	1	9,41	39	3	13,99	19	5	18,72	05	7	23,62
97	5,0	5,09	67	2	9,52	43	4	14,10	24	6	18,84	10	8	23,74
1,0201	1	5,19	71	3	9,63	47	5	14,21	28	7	18,95	15	9	23,86
05	2	5,30	75	4	9,74	51	6	14,32	33	8	19,07	19	22,0	23,98
09	3	5,40	80	5	9,84	56	7	14,43	37	9	19,18	24	1	24,10
13	4	5,51	84	6	9,95	60	8	14,55	41	18,0	19,30	28	2	24,22
17	5	5,61	88	7	10,06	64	9	14,66	46	1	19,41	33	3	24,33
21	6	5,71	92	8	10,17	68	14,0	14,77	50	2	19,53	37	4	24,45
25	7	5,82	96	9	10,27	73	1	14,88	55	3	19,64	42	5	24,57
29	8	5,92	1,0400	10,0	10,38	77	2	14,99	59	4	19,76	46	6	24,69
33	9	6,03	04	1	10,49	81	3	15,10	63	5	19,88	51	7	24,81
37	6,0	6,13	09	2	10,60	85	4	15,22	68	6	19,99	56	8	24,93
41	1	6,24	13	3	10,71	89	5	15,33	72	7	20,11	60	9	25,05
45	2	6,34	17	4	10,81	94	6	15,44	77	8	20,22	65	23,0	25,17
49	3	6,45	21	5	10,92	98	7	15,55	81	9	20,34	69	1	25,29
53	4	6,55	25	6	11,03	1,0603	8	15,66	85	19,0	20,45	74	2	25,41
57	5	6,66	29	7	11,14	07	9	15,78	90	1	20,57	78	3	25,53
61	6	6,76	33	8	11,25	11	15,0	15,89	94	2	20,69	83	4	25,65
65	7	6,87	38	9	11,36	15	1	16,00	99	3	20,80	87	5	25,77
69	8	6,97	42	11,0	11,47	20	2	16,11	1,0803	4	20,92	92	6	25,89
73	9	7,08	46	1	11,57	24	3	16,22	07	5	21,04	97	7	26,01
77	7,0	7,18	50	2	11,68	28	4	16,34	12	6	21,15	1,1001	8	26,13
81	1	7,29	54	3	11,79	33	5	16,45	16	7	21,27	06	9	26,25
85	2	7,39	59	4	11,90	37	6	16,56	21	8	21,39	10	24,0	26,38
89	3	7,50	63	5	12,01	41	7	16,68	25	9	21,50	15	1	26,50
94	4	7,60	67	6	12,12	46	8	16,79	30	20,0	21,62	20	2	26,62
98	5	7,71	71	7	12,23	50	9	16,90	34	1	21,74	24	3	26,74
1,0302	6	7,82	75	8	12,34	54	16,0	17,02	39	2	21,85	29	4	26,86
06	7	7,92	80	9	12,45	59	1	17,13	43	3	21,97	33	5	26,98
10	8	8,03	84	12,0	12,56	63	2	17,24	48	4	22,09	38	6	27,10
14	9	8,13	88	1	12,67	67	3	17,36	52	5	22,21	43	7	27,22
18	8,0	8,24	92	2	12,78	72	4	17,47	56	6	22,32	47	8	27,35
22	1	8,35	96	3	12,89	76	5	17,58	61	7	22,44	52	9	27,47
												56	25,0	27,59

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

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International Involvement
ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

More Information?
Contact us at the following address.
The Head Office of ESA is at Addis Ababa.

☎ 011- 646 06 85, 011- 646 05 65
📠 011-646 08 80
✉ 2310 Addis Ababa, Ethiopia
E-mail: info@ethiostandards.org,
Website: www.ethiostandards.org

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